

**HIGHWAY PATROL RETIREMENT SYSTEM**

**STATE OF MONTANA**

**ACTUARIAL VALUATION**

**AS OF JULY 1, 1992**

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ACTUARIAL CONSULTANTS



Highway Patrol Retirement System

State of Montana

Actuarial Valuation

As of July 1, 1992



# Highway Patrol Retirement System

## Table of Contents

	Page
<u>Section I</u>	
Introduction	1
Actuarial Certification	1
<u>Section II</u>	
Analysis of Valuation	2
<u>Section III</u>	
Schedule 1 - Normal Cost Allocation	4
Schedule 2 - Present Value of Benefits	5
Schedule 3 - Liability Allocation and Statutory Funding	6
Schedule 4 - Unfunded Liability Amortization Schedule	7
Schedule 5 - Comparison of Valuations	8
Schedule 6 -	
Table 1 - Number of Active Members	9
Table 2 - Average Salaries of Active Members	10
Table 3 - Number of Vested Inactive Members	11
Table 4 - Number of Retired Members	12
Table 5 - Average Benefits of Retired Members	13
Table 6 - Number of Disabled Members	14
Table 7 - Average Benefits of Disabled Members	15
Table 8 - Number of Survivors	16
Table 9 - Average Benefits of Survivors	17
<u>Section IV</u>	
Actuarial Funding Method	18
Discussion of Actuarial Assumptions	19
Illustration of Actuarial Assumptions	20
<u>Section V</u>	
Summary of Benefit Provisions	22



# Highway Patrol Retirement System

## Section I

### Introduction

An actuarial valuation of the Highway Patrol Retirement System of the State of Montana has been completed as of July 1, 1992. This valuation was authorized by the Public Employees' Retirement Board under Section 19-6-202, MCA. The purpose of the valuation was to determine the financial position of the fund, the normal cost, and the unfunded accrued liability based upon present and prospective assets and liabilities of the system as of July 1, 1992.

Section II presents an analysis of the results of the actuarial valuation. The numerical findings and membership data supporting this analysis are shown in Section III.

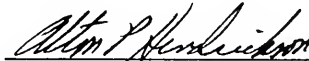
In conducting the actuarial valuation, certain assumptions were made as to the future experience of the system. A summary and discussion of each of the assumptions is contained in Section IV.

The valuation is based upon the Highway Patrol Retirement Act and incorporates all amendments as of July 1, 1992. A summary of the major provisions of the Act is contained in Section V.

### Actuarial Certification

The results of the actuarial valuation shown in this report are based upon information provided by the Public Employees' Retirement Division regarding plan participants, plan assets and other matters. The values have been calculated on the basis of actuarial assumptions which, in my opinion, are appropriate for purposes of this valuation.

This valuation has been prepared in accordance with generally accepted actuarial principles and practices and, to the best of my knowledge, fairly reflects the actuarial position of the Highway Patrol Retirement System as of July 1, 1992.



Alton P. Hendrickson  
Member, American Academy  
of Actuaries





## Highway Patrol Retirement System

### Section II

#### Analysis of Valuation

##### Results of Valuation

An actuarial valuation has been conducted for the Highway Patrol Retirement System as of July 1, 1992. This valuation has determined that the percent of each member's compensation required to fund the benefits as they accrue in the future is 27.31%. The regular contribution rate of 45.28% allows 17.97% to be applied to the unfunded past service liability. This percent is sufficient to amortize the unfunded past service liability over a period of 28.8 years. This period has decreased from 31.97 years in 1990.

##### Asset Valuation

Past actuarial valuations have valued assets at market value, with gain and loss fluctuations smoothed over a 6-year period. This procedure has been conservative and slow to recognize recent market performance. The current actuarial valuation has accelerated the rate at which gains and losses are recognized by smoothing the fluctuations over a shorter period of 4 years. The table below illustrates this valuation procedure:

	Actual		Adjusted
	-----		-----
Cost Value as of 6/30/92	31,167,177		31,167,177
1992 Market Gain	1,802,180	x .25	450,545
1991 Market Gain	435,528	x .50	217,764
1990 Market Gain	36,358	x .75	27,269
Prior Market Gain	1,848,231	x 1.00	1,848,231
	-----		-----
Market Value as of 6/30/92	35,289,474		33,710,986

##### Investment Performance

The rate of investment return during 1991-92 was 14.12% on a market value basis and 8.93% on a cost value basis. These rates were based on all assets of the system including accruals, and assumed uniform fund activity throughout the year.

##### Benefits and Contributions

As of July 1, 1991, the Highway Patrol Retirement System benefits were improved to provide one-half pay after 20 years of service rather than 25. A minimum benefit of 2% of the salary of a probationary officer for each year of service was also established. This minimum cannot increase more than 5% each year.

In addition, a lump sum payment is made to members who retired prior to July 1, 1991 who are at least age 55 and have been retired at least 5 years which is



funded by twenty five cents on each license registration fee. This amount will be limited by the consumer price index increase after August 31, 1993.

To fund these benefits, the member contribution rate has been increased from 7.59% of compensation to 9%. The employer contribution rate was increased from 26.75% to 36.28%.

#### Amortization of The Unfunded Liability

An amortization schedule has been prepared as part of each biennial valuation to amortize new liability gains and losses over a 40-year period. The amortization period of past liabilities decreases 2 years with each valuation. The schedule began with an initial liability established on July 1, 1984.

The Public Employees' Retirement Board has set a goal of funding liabilities over a period not to exceed 30 years. The schedule in this report illustrates the rate required to fund each valuation's new liabilities over a 30-year period.

#### Actuarial Assumptions

The actuarial assumptions used in the valuation of July 1, 1990 were continued in this valuation. A review of the system's data and experience did not reveal any deviations which warranted a change.

#### Summary of Data

The active membership was 203 on July 1, 1992 which is an increase of 8 members from July 1, 1990. The annual payroll increased from \$5.17 to \$5.58 million during the biennium. The average pay per member grew 1.7% per year.

The average active member is 39.5 years of age, was employed at age 27.3, has completed 12.2 years of service, and earns \$27,464.

The number of members receiving benefits was 201 which is an increase of 19 members from July 1, 1990. The annual benefit payout increased from \$1.76 to \$2.20 million during the biennium. The benefit payout per member grew at the rate of 6.2% per year.

The average retiree is 62.9 years of age, retired at age 50.7 with 24.2 years of service, and receives a benefit of \$951 per month.

#### Conclusion

Mainly because of improved benefits, the system's total liability grew by 20.9%. This was offset by a 25.4% growth in assets. The current funding level allows the system's unfunded liability to be funded over 28.80 years compared to 31.97 years in 1990. Part of this decrease is attributable to smoothing market value changes over 4 years rather than 6.

Based on the results of this valuation, the Highway Patrol Retirement System is actuarially sound.



Highway Patrol Retirement System

Section III

Schedule 1

Normal Cost Allocation

(1) Normal Cost Contribution Rate:

(a) Retirement	24.50%
(b) Death	0.69
(c) Disability	1.33
(d) Vested	0.24
(e) Withdrawals	0.55
	-----
(f) Total Rate	27.31%

(2) Present Value of Future Salaries Of Current Members	\$ 35,731,876
(4) Present Value of Future Normal Costs For Current Members (1(f) * (2))	\$ 9,758,375



# Highway Patrol Retirement System

## Schedule 2

### Present Value of Benefits

#### (1) Present Value of Benefits - Inactive Members

(a) Retirement	\$ 28,003,788
(b) Death	1,124,156
(c) Disability	1,554,260
(d) Vested	218,735
(e) Withdrawals	6,128
	-----
(f) Total Inactive	\$ 30,907,067

#### (2) Present Value of Benefits - Active Members

(a) Retirement	\$ 34,764,937
(b) Death	381,764
(c) Disability	730,710
(d) Vested	155,021
(e) Withdrawals	266,009
	-----
(f) Total Active	\$ 36,298,441
	-----

(3) Total Liabilities	\$ 67,205,508
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# Highway Patrol Retirement System

## Schedule 3

### Liability Allocation and Statutory Funding

#### (1) Unfunded Past Service Liability

(a) Present Value of Benefits	\$ 67,205,508
(b) Present Value of Future Normal Costs	\$ 9,758,375
(c) Fund Assets	\$ 33,710,986
	-----
(d) Unfunded Liability (a)-(b)-(c)	\$ 23,736,147

#### (2) Contribution Rates Amortized over 28.80 Years

(a) Present Value of Salaries During Next 28.80 Years	\$ 132,087,623
(b) Unfunded Contribution Rate (1(d)/2(a))	17.97%
(c) Normal Cost Rate (Schedule 1)	27.31
	-----
(d) Statutory Funding Rate	45.28%



# Highway Patrol Retirement System

## Schedule 4

### Unfunded Liability Amortization Schedule

#### (1) Biennial Unfunded Past Service Liability Accounts

1984 Liability Account as of 7/1/90	\$	13,219,782
Interest Charge on Liability Account		2,199,772
Contributions Applied to Liability		1,859,403
Interest Credit on Contributions		143,401
1984 Liability Account as of 7/1/92	\$	13,416,750
1986 Liability Account as of 7/1/90	\$	11,057,522
Interest Charge on Liability Account		1,839,972
Contributions Applied to Liability		1,555,274
Interest Credit on Contributions		119,946
1986 Liability Account as of 7/1/92	\$	11,222,274
1988 Liability Account as of 7/1/90	\$	-1,951,975
Interest Charge on Liability Account		-324,809
Contributions Applied to Liability		-274,551
Interest Credit on Contributions		-21,174
1988 Liability Account as of 7/1/92	\$	-1,981,059
1990 Liability Account as of 7/1/90	\$	-2,811,993
Interest Charge on Liability Account		-467,916
Contributions Applied to Liability		-395,515
Interest Credit on Contributions		-30,503
1990 Liability Account as of 7/1/92	\$	-2,853,891

#### (2) Actuarial Gain/Loss

Current Unfunded Liability (Schedule 3)	\$	23,736,147
Less 1984 Liability Account		13,416,750
Less 1986 Liability Account		11,222,274
Less 1988 Liability Account		-1,981,059
Less 1990 Liability Account		-2,853,891
		-----
1992 Liability Account as of 7/1/92	\$	3,932,073

#### (3) Required Contribution Rate

Normal Cost Rate (Schedule 1)	27.31%
Rate to Fund 1984 Liability Over 22 Years	12.72
Rate to Fund 1986 Liability Over 24 Years	9.88
Rate to Fund 1988 Liability Over 26 Years	-1.63
Rate to Fund 1990 Liability Over 28 Years	-2.21
Rate to Fund 1992 Liability Over 30 Years	2.88
	-----
Contribution Rate for 30-Year Schedule	48.95%



# Highway Patrol Retirement System

## Schedule 5

### Comparison of Valuations

	1990	1992
(1) Unfunded Past Service Liability	-----	-----
(a) Present Value of Benefits	\$55,587,109	\$67,205,508
(b) Present Value of Future Costs	\$ 9,182,532	\$ 9,758,375
(c) Fund Assets	\$26,891,241	\$33,710,986
(d) Unfunded Liability	\$19,513,336	\$23,736,147
(2) Amortization Period and Contribution Rates		
(a) Years for Amortization	31.97	28.80
(b) Unfunded Contribution Rate	14.65%	17.97%
(c) Normal Cost Rate	21.85%	27.31%
(d) Statutory Funding Rate	36.50%	45.28%
(3) Active Members		
(a) Number of Members	195	203
(b) Annual Payroll	\$ 5,170,508	\$ 5,575,233
(c) Average Annual Salary	\$ 26,515	\$ 27,464
(4) Inactive Members		
(a) Number of Retired	154	174
(b) Number of Disabled	10	11
(c) Number of Survivors	18	16
(d) Number of Vested Deferred	2	3
(e) Annual Benefits	\$ 1,759,767	\$ 2,195,855
(f) Average Monthly Benefit	\$ 806	\$ 910



# Highway Patrol Retirement System

## Schedule 6

Table 1

### Number of Active Members

Years of Service	Member's Age									Total
	20-25	25-29	30-34	35-39	40-44	45-49	50-54	55-59	OVER 60	
0-4	4	30	25	11	2					72
5-9		2	11	8	5					26
10-14			2	8	7	4				21
15-19				2	23	11		1		37
20-24					5	14	11			30
25-29						1	9			10
30-34							1	3	2	6
35-39									1	1
40-UP										
Total	4	32	38	29	42	30	21	4	3	203





# Highway Patrol Retirement System

Table 2

## Average Salaries of Active Members

Years of Service	Member's Age									Total
	20-25	25-29	30-34	35-39	40-44	45-49	50-54	55-59	OVER 60	
0-4	22824	22718	22837	23074	23546					22843
5-9		26756	25064	25319	26323					25515
10-14			27835	27771	28081	28191				27960
15-19				29664	31439	30907		30953		31172
20-24					29994	32098	31388			31487
25-29						30933	33217			32988
30-34							32364	34184	34813	34090
35-39									47603	47603
40-UP										
Total	22824	22971	23745	25444	29723	31102	32218	33376	39076	27464



# Highway Patrol Retirement System

Table 3

Number of Vested Inactive Members

Years of Service	Member's Age									Total
	20-25	25-29	30-34	35-39	40-44	45-49	50-54	55-59	Over 60	
0-4										
5-9									1	1
10-14										
15-19					2					2
20-24										
25-29										
30-34										
35-39										
40-UP										
Total					2				1	3



# Highway Patrol Retirement System

Table 4

Number of Retired Members

Member's Service	Recipient's Age									Total
	< 45	45-49	50-54	55-59	60-64	65-69	70-74	75-79	Over 80	
0-4										
5-9				1						1
10-14			1	4	1	1	1			8
15-19				1	2					3
20-24	1	11	20	14	9	8	3	5	12	83
25-29		1	11	11	11	5	8	1	9	57
30-34			1	6	4	5	1	1	1	19
35-39					1	1				2
40-UP						1				1
Total	1	12	33	37	28	21	13	7	22	174



# Highway Patrol Retirement System

Table 5

## Average Benefits of Retired Members

Member's Service	Recipient's Age									Total
	< 45	45-49	50-54	55-59	60-64	65-69	70-74	75-79	Over 80	
0-4										
5-9				518						518
10-14			133	189	246	108	422			208
15-19				150	247					214
20-24	1317	1115	1031	816	828	678	686	516	499	833
25-29		1675	1407	1159	1070	981	772	783	679	1046
30-34			2598	1576	1558	1517	795	984	906	1503
35-39					1947	1410				1679
40-UP						1966				1966
Total	1317	1162	1177	947	1005	1019	727	621	591	951

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# Highway Patrol Retirement System

Table 6

## Number of Disabled Members

Member's Service	Recipient's Age									Total
	< 45	45-49	50-54	55-59	60-64	65-69	70-74	75-79	Over 80	
0-4	1									1
5-9		2								2
10-14					1					1
15-19			1	1						2
20-24		2	2						1	5
25-29										
30-34										
35-39										
40-UP										
Total	1	4	3	1	1				1	11



# Highway Patrol Retirement System

Table 7

## Average Benefits of Disabled Members

Member's Service	Recipient's Age									Total
	< 45	45-49	50-54	55-59	60-64	65-69	70-74	75-79	Over 80	
0-4	509									509
5-9		921								921
10-14					456					456
15-19			1092	644						868
20-24		582	1148						648	821
25-29										
30-34										
35-39										
40-UP										
Total	509	751	1129	644	456				648	786



# Highway Patrol Retirement System

Table 8

Number of Survivors

Member's Service	Recipient's Age									Total
	< 45	45-49	50-54	55-59	60-64	65-69	70-74	75-79	Over 80	
0-4										
5-9	3								1	4
10-14									1	1
15-19									2	2
20-24		1							5	6
25-29						1			2	3
30-34										
35-39										
40-UP										
Total	3	1				1			11	16



# Highway Patrol Retirement System

Table 9

## Average Benefits of Survivors

Member's Service	Recipient's Age									Total
	< 45	45-49	50-54	55-59	60-64	65-69	70-74	75-79	Over 80	
0-4										
5-9	282								428	319
10-14									642	642
15-19									540	540
20-24		1092							508	606
25-29						983			629	747
30-34										
35-39										
40-UP										
Total	282	1092				983			541	554





## Highway Patrol Retirement System

### Section IV

#### Actuarial Funding Method

The cost of the retirement system will be determined by its future experience. In calculating the financial requirements of the fund, certain assumptions were made as to the expected future experience. This section summarizes the funding method applied as well as the actuarial assumptions used.

Any variations in the actual experience of the fund from those assumed in this valuation may cause changes in the projected future costs of the fund. It is therefore necessary that the actuarial assumptions be reviewed from time to time with adjustments as experience warrants. It is also important that regular valuations be performed to determine the financial effect of variations between the actual and assumed experience.

The assumptions used in the valuation are based upon the past experience of the fund together with projections as to future experience.

The method of funding employed is commonly referred to as the entry age normal cost method. This method establishes a normal cost as well as an unfunded accrued liability. The normal cost is the level percentage of total salaries required to fund the benefits, assuming this percentage has been contributed since each member's entry into the fund.

The unfunded accrued liability represents the excess of the present value of total liabilities over the present value of the fund assets and the present value of expected future contributions at the normal cost rate.

In order to maintain the fund on an actuarially sound basis, the rate of contribution should be such as to provide for the normal cost in addition to making progress towards the amortization of the unfunded liability.



Highway Patrol Retirement System  
Discussion of Actuarial Assumptions

Mortality Rates

The mortality rates for males and females are based upon the 1983 Group Annuity Mortality Table, and apply to both active members and those receiving benefits.

Disability Rates

The disability rates for males and females are based upon the 1983 Disability Table, adjusted to reflect the higher rates experienced by the members.

Withdrawal Rates

The withdrawal rates are based upon the actual experience of the system as determined in the 1987 withdrawal experience study.

Salary Scale

The rates of salary increase are based upon an assumed compounded growth rate of 6.5% per annum.

Investment Earnings

It was assumed that the investment earnings would be 8% compounded annually.

Asset Valuation

The assets are based on market value, with gains and losses graduated over a 4-year period.

Administrative Expenses

It was assumed that the system would incur no administrative expenses beyond those provided by investment earnings in excess of 8%.

Termination Benefits

It was assumed that all members terminating with less than five years of service would receive an immediate withdrawal of their member contributions with interest. It was further assumed that members with five or more years of service would select the most advantageous benefits under the given assumptions.



# Highway Patrol Retirement System

## Illustration of Actuarial Assumptions

### Mortality Rates

The mortality rates are based upon the 1983 Group Annuity Mortality Table.

Age	Deaths Per 10,000 Male Members	Deaths Per 10,000 Female Members
25	5	3
30	6	3
35	9	5
40	12	7
45	22	10
50	39	16
55	61	25
60	92	42
65	156	71
70	275	124
75	446	240
80	741	429
85	1,148	699

### Disability Rates

The disability rates are based upon the 1983 Disability Table, adjusted to reflect the higher rates experienced by the members.

Age	Disabilities per 10,000 Male Members	Disabilities per 10,000 Female Members
25	3	3
30	6	9
35	9	15
40	18	27
45	36	45
50	60	66
55	153	123
60	314	260



### Withdrawal Rates

The withdrawal rates illustrated below reflect the turnover experienced by the Highway Patrol Retirement System.

Age	Withdrawals Per 10,000 Active Members
25	592
30	336
35	211
40	195
45	104
50	0

### Salary Scale

The salary increases are based upon an assumed compounded growth rate of 6.5% per annum.

### Investment Earnings

Future investment earnings are assumed to be 8% compounded annually.

### Asset Valuation

The assets are based on market value, with gains and losses graduated over a 4-year period.

### Administrative Expenses

It was assumed that the administrative expenses would be recovered by investment earnings in excess of 8%.





## Highway Patrol Retirement System

### Section V

#### Summary of Benefits and Contributions

Employee Contributions -	9% of member's compensation.
State Contributions -	36.28% of members' compensation.
Retirement Benefit -	<p>Eligibility: Age 50 and 20 years of service. There is no age requirement if first employed prior to July 1, 1985.</p> <p>Normal Form: Life payments, with full benefits continuing to the surviving spouse or dependent children upon the member's death.</p> <p>Benefit: 2.5% of the final compensation for each year of service.</p>
Disability Benefit -	<p>Service disability: 50% of final compensation.</p> <p>Nonservice disability: Actuarial equivalent of accrued benefit based on retirement at age 50.</p>
Death Benefit -	<p>Service death: 50% of final compensation less any payments from workers' compensation.</p> <p>Nonservice death: Actuarial equivalent of accrued benefit based on retirement at age 50.</p>
Termination Benefit -	Prior to 5 years of service, return of member contributions. After 5 years, the member may elect the actuarial equivalent of the accrued benefit based on retirement at age 60.
Benefit Adjustments -	<p>If the benefits are less than a minimum of 2% of the base salary of a probationary officer for each year of the member's service, the benefits are to be increased to such minimum amount. The annual increase may not exceed 5% of the benefit.</p> <p>A lump sum payment will be made to members retired prior to July 1, 1991 who are at least age 55 and have been retired at least 5 years. This lump sum is funded by twenty five cents on each license registration fee. After August 31, 1993, this lump sum amount will be limited by the consumer price index increase.</p>

